Omicron variant showed lower neutralizing sensitivity than other SARS-CoV-2 variants to immune sera elicited by vaccines after boost

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Abstract

ABSTRACT The emerging new VOC B.1.1.529 (Omicron) variant has raised serious concerns due to multiple mutations, reported significant immune escape, and unprecedented rapid spreading speed. Currently, studies describing the neutralization ability of different homologous and heterologous booster vaccination against Omicron are still lacking. In this study, we explored the immunogenicity of COVID-19 breakthrough patients, BBIBP-CorV homologous booster group and BBIBP-CorV/ZF2001 heterologous booster group against SARS-CoV-2 pseudotypes corresponding to the prototype, Beta, Delta, and the emergent Omicron variant. Notably, at 14 days post two-dose inactivated vaccines, pVNT titre increased to 67.4 GMTs against prototype, 8.85 against Beta and 35.07 against Delta, while neutralization activity against Omicron was below the lower limit of quantitation in 80% of the samples. At day 14 post BBIBP-CorV homologous booster vaccination, GMTs of pVNT significantly increased to 285.6, 215.7, 250.8, 48.73 against prototype, Beta, Delta, and Omicron, while at day 14 post ZF2001 heterologous booster vaccination, GMTs of pVNT significantly increased to 1436.00, 789.6, 1501.00, 95.86, respectively. Post booster vaccination, 100% samples showed positive neutralization activity against Omicron, albeit illustrated a significant reduction (5.86- to 14.98-fold) of pVNT against Omicron compared to prototype at 14 days after the homologous or heterologous vaccine boosters. Overall, our study demonstrates that vaccine-induced immune protection might more likely be escaped by Omicron compared to prototypes and other VOCs. After two doses of inactivated whole-virion vaccines as the “priming” shot, a third heterologous protein subunit vaccine and a homologous inactivated vaccine booster could improve neutralization against Omicron.